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Protoluciola albertalleni gen.n., sp.n., a new Luciolinae firefly (Insecta: Coleoptera: Lampyridae) from Burmite amber

Protoluciola albertalleni gen.n., sp.n., новый светлячок подсемейства Luciolinae (Insecta: Coleoptera: Lampyridae) из бирманского янтаря

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КЛЮЧЕВЫЕ СЛОВА: Coleoptera, Lampyridae, новый род, новый вид, бирманский янтарь, палеоэнтомология, мел.

ABSTRACT: A new fossil genus of fireflies, *Protoluciola* **gen.n.**, and a new species, *P. albertalleni* **sp.n.**, from Cretaceous Burmite amber is described. The new, apparently capable of emitting light 100–million-year-old taxon is placed in Luciolinae.

РЕЗЮМЕ: Из мелового бирманского янтаря описывается новый род Lampyridae, *Protoluciola* **gen.n.**, и новый вид, *P. albertalleni* **sp.n.** Новый, обладавший люминесцентными свойствами таксон, возраст которого составляет примерно 100 миллионов лет, помещается в Luciolinae.

Introduction

First fireflies were reported from Baltic amber before World War I [Klebs, 1910]. However, it was not until the XXI century that the first two amber lampyrid taxa were actually described [Kazantsev, 2012a, b]. Both came from Baltic Eocene amber - one, *Electotreta* Kazantsev, 2012, placed in the subfamily Ototretinae, the other, *Eoluciola* Kazantsev, 2012, in the Luciolinae.

Until now no fossil fireflies from other ambers have been known [Kazantsev, 2013]. However, a study of Burmite amber inclusions has resulted in the discovery of a lucioline-looking firefly preserved in good condition in a transparent amber specimen. The discovered firefly could not be attributed to *Luciola* Laporte, 1833, or any other lucioline taxon, and appeared to represent a new, hypothetically now extinct, genus.

The description of the new genus and the new species is presented below.

Taxonomy

Protoluciola Kazantsev **gen.n.**

Type species: *Protoluciola albertalleni* Kazantsev **sp.n.**

DESCRIPTION. **Male**. Alate, flattened, elongate. Head relatively small, transverse, semi-exposed. Eyes large, spherical, broadly separated above. Labrum small, narrow, not well sclerotised. Mandibles small, evenly curved. Palps small, slender; ultimate palpomeres elongate and pointed. Antennal sockets small, separated by ca. their diameter. Antenna 11–segmented, narrow and short, filiform; scapus elongate, narrow; pedicel (antennomere 2) noticeably longer than antennomere 3 (Figs 1–3).

Pronotum transverse, narrowing anteriorly from posterior angles, punctate, with explanate sides and rounded posterior angles (Figs 1–3). Prosternum short, V-shaped. Scutellum triangular, rounded at apex (Fig. 1). Elytra elongate, flattened, almost parallel-sided, with prominent, but not extending beyond humeral area humeral costa, otherwise just punctate; humerus visible from below, not covered by epipleuron (Figs 1–3). Epipleuron attaining to elytral middle, widest near humerus (Fig. 3). Metathoracic wings fully developed.

Legs slender; front and middle coxae elongate, hind coxae transverse, middle and hind coxae separated; hind trochanters triangular, bulging, conspicuously more prominent than front and middle ones; femurs and tibiae straight, flattened, subequal in length, femurs narrowed distally, tibiae widened distally, tibial spurs apparent; tarsi narrow, tarsomeres without plantar pads, tarsomeres 3 and 4 deeply incised (Figs 1–4); claws simple.

Abdomen with six ventrites, ventrite 1 visible only at sides, ventrite 4 with conspicuous semicircular fold; ventrite 5 with light organ (Fig. 4).

Aedeagus tripartite, with straight pointed distally median lobe; parameres also narrow, straight and pointed (Fig. 4).



Figs 1–2. General view of *Protoluciola albertalleni* **gen.n.**, **sp.n.,** holotype male: 1 — dorsally; 2 — ventrally. Scale bar: 1 mm.
Рис. 1–2. Общий вид *Protoluciola albertalleni* **gen.n.**, **sp.n.,** голотип, самец. 1 — сверху; 2 — снизу. Масштабная линейка: 1 mm.



Figs 3–4. Details of *Protoluciola albertalleni* **gen.n.**, **sp.n.,** holotype male, ventrally. 3 — anterior part of body; 4 — posterior part of body. Scale bar: 0.5 mm.

Рис. 3–4. Детали строения *Protoluciola albertalleni* **gen.n.**, **sp.n.,** голотип, самец, снизу. 3 — передняя часть тела; 4 — задняя часть тела. Масштабная линейка: 0.5 mm.

Female. Unknown.

ETYMOLOGY. The name of the new genus is a combination of "proto", the Ancient Greek for «first», and the genus name "Luciola". Gender feminine.

DIAGNOSIS. *Protoluciola* **gen.n.** appears to be somewhat similar to *Atyphella* Olliff, 1889, distinguishable from the latter, as well as from all the other lucioline genera [e.g., Ballantyne, Lambkin, 2009] by the absence of elytral longitudinal costae, with the humeral costa developed only at humerus, attaining only to elytral middle epipleuron, separated middle and hind coxae, conspicuous semicircular fold on ventrite 4 and light organ only on ventrite 5.

DISTRIBUTION. Only known from Burmite amber.

REMARKS. It is not always easy to determine whether the firefly has a light organ or not, especially when the organ is small and/or the firefly is characterised by reduced light-emitting features, without observing the species in nature. However, the quality of preservation of the holotype of *Protoluciola albertalleni* **gen.n.**, **sp.n.** in the amber specimen is such that the light organ on the surface of penultimate ventrite is quite apparent (Fig. 4). The location and size of the photic organ resemble those in many modern Lampyridae.

Protoluciola albertalleni Kazantsev **sp.n.**
Figs 1–4.

MATERIAL: Holotype, male, specimen No. ICM-BU-1687–1, Burmite amber, Cretaceous (Insect Centre, Moscow).

DESCRIPTION. **Male**. Dark brown, with whitish yellow and dark yellow spot on penultimate ventrite.

Eyes large, interocular dorsal distance subequal to eye radius. Ultimate maxillary palpomere narrow, ca. 2.5 times longer than wide, noticeably narrowed distally. Antennae filiform, attaining to elytral humeri, scapus narrow, elongate, about two times longer than pedicel; pedicel (antennomere 2) ca. 1.5 times longer than antennomere 3 and subequal in length to antennomere 4; antennomere 4 ca. 1.5 times longer than antennomere 5; antennomeres 6–10 short, about as wide as long; antennal vestiture long and erect (Figs 1–4).

Pronotum transverse, ca. 2 times as wide as long, bisinuate posteriorly, with broadly rounded posterior angles (Figs 1–3).

Elytra ca. 1.8 times as long as wide at humeri (Fig. 1).

Tarsomere 1 the longest, considerably longer than tarsomere 2, tarsomere 2 subequal in length to tarsomere 5 and about as long as tarsomeres 3–4 combined (Figs 1–4).

Ultimate ventrite (ventrite 6) broad, triangular, rounded distally, light organ occupying almost entire surface of penultimate ventrite (Fig. 2).

Aedeagus with narrow pointed distally median lobe; parameres noticeably longer than median lobe (Fig. 4).

Length (from anterior head margin to end of elytra): 2.5 mm. Width (humerally): 1,0 mm.

SYNINCLUSIONS. One Diptera (Chironomidae?).

Female. Unknown.

ETYMOLOGY. The new species is named after Mr. Albert Allen (Boise, Idaho) who discovered this remarkable firefly inclusion while screening Burmite amber specimens and donated it to the collection of the Insect Centre, Moscow.

DIAGNOSIS. *Protoluciola albertalleni* **sp.n.**, the only known representative of the genus, is distinguishable from other luciolines by the generic characters.

Discussion

The only known until now amber firefly taxa, *Electotreta* and *Eoluciola*, date back to some 45 million years ago, according to the estimated age of Baltic amber and represent the Eocene fauna [e.g., Gaigalas, Halas, 2009]. The discovery of *Protoluciola* **gen.n.** in Burmite amber significantly extends the age of the group, as Burmite is considered to be formed during the Cretaceous, i.e. some 100 million years ago [e.g., Shi et al., 2012]. On the other hand, both *Electotreta* and *Eoluciola* lack any traces of a light organ [Kazantsev, 2012a, b], whereas the new genus has an apparent photic organ on its abdomen. In this respect *P. albertalleni* **gen.n.**, **sp.n.** appears to be the first known fossil luminescent firefly, which means that luminescence has existed in the lampyrid subfamily Luciolinae for at least 100 million years and already the Cretaceous forests were enlivened with lights of fireflies at night.

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References

Ballantyne L.A., Lambkin C.L. 2009. Systematics of Indo-Pacific fireflies with a redefinition of Australasian *Atyphella* Olliff, Madagascan *Photuroluciola* Pic, and description of seven new genera from the Luciolinae (Coleoptera: Lampyridae) // Zootaxa. Vol.1997. P.1–188.

Gaigalas A., Halas S. 2009. Stable isotopes (H, C, S) and the origin of Baltic amber // Geochronometria. Vol.33. P.33–36.

Kazantsev S.V. 2012a. New omethid and lampyrid taxa from the Baltic Amber (Insecta: Coleoptera) // Zootaxa. Vol.3186. P.59–63.

Kazantsev S.V. 2012b. A new Luciolinae firefly (Coleoptera: Lampyridae) from the Baltic Amber // Russian Entomological Journal. Vol.21. No.3. P.319–320.

Kazantsev S.V. 2013. A Brief Review of Fireflies in Amber (Coleoptera: Lampyridae) // The Lampyrid. Vol.3. P.96–99.

Klebs R. 1910. Über Bernstein einschlusse im allgemeinen und die Coleopteren meiner Bersteinsammlung // Schriften der physikalisch-Ökonomischen gesellshaft zu Königsberg. B.51. H.3. S.217–242.

Shi G., Grimaldi D.A., Harlow G.E., Wang J., Wang J., Yang M., Lei W., Li Q., Li X. 2012. Age constraint on Burmese amber based on U–Pb dating of zircons // Cretaceous Research. Vol.37. P.155–163.